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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/618,431	07/18/2000	Siu Chung Tam	A33341	9438

21003 7590 10/10/2003

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EXAMINER	
MONDT, JOHANNES P	
ART UNIT	PAPER NUMBER
2826	

DATE MAILED: 10/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Applicati n No.	Applicant(s)	
	09/618,431	TAM ET AL.	
	Examiner	Art Unit	
	Johannes P Mondt	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

P riod for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 August 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disp sition of Claims

4)☒ Claim(s) *1-4 and 6-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,9-11 and 13-17* is/are rejected.

7)☒ Claim(s) *6-8 and 12* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8/27/3 has been entered.

Response to Amendment

Amendment under 37 C.F.R. § 1.116 filed 5/29/3 has been entered following aforementioned Request for Continued Examination. In said Amendment Applicants amended the substance of all previously outstanding claims through amendment of the independent claim 1 while the further limitation of claim 3 has also been amended. Applicants cancelled claim 5 and added new claim 17. Comments on Remarks included in said Amendment (see below under "Response to Arguments") can thus be restricted to those aspects still relevant even for the amended claim language.

Response to Arguments

2. Applicant's arguments filed 5/29/03 have been fully considered but they are not persuasive to the full claim set. In particular, arguments for traverse of all previously outstanding claims are directed to the old claim language. However, the examiner agrees that Sartorius does not teach a passive Q-switch with coating with variable

transmittance for different locations of said coating, said passive Q-switch aspect in Sartorius relying on the positioning of combs. Therefore, the rejection over Sartorius of 1-2 and 14 is not repeated here. Furthermore, a coating of a semiconductor passive Q-switch of variable transmittance for different locations of said coating is not taught either by Meissner et al, and hence the previous rejections of claims 1-4, 9, 11 and 14-16 over Meissner et al in view of Birnbaum et al, are not repeated. However, new rejections for claims 1-4, 9, 10, 11 presently amended by Applicant is herewith presented. Finally, claim 17, being a new claim, is herewith examined for the first time.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. ***Claims 1-4, 11 and 14-16*** are rejected under 35 U.S.C. 103(a) as being unpatentable over Birnbaum et al (5,832,008) (previously made of record) in view of Rand (4,833,333). Birnbaum et al teach a semiconductor passive Q-switch (cf. title) suitable for use in a laser system to produce laser pulses having variable output characteristics including a laser wavelength (cf. abstract). Birnbaum et al do not necessarily teach the further limitation said semiconductor passive Q-switch to have a coating with variable transmittance for different locations of said coating at the lasing wavelength for tuning said output characteristics of said laser pulses. However, it would

have been obvious to include said further limitation in view of Rand, who teaches (cf. Figures 2 and 4, and col. 4, l. 63 – col. 6, 16) a distribution of color centers in a passive Q-switch (cf. abstract, first sentence) in a direction perpendicular to the direction of the laser light (namely: radial direction, while in Rand's coordinate system the laser light is directed along the cylinder axis; cf. col. 2, l. 26-33; see also col. 1, l. 34-40 as for the influence on transmittance at the laser wavelength by the color centers).

Motivation, to include the teaching by Rand in the invention by Birnbaum et al, stems from the reduction of the beam divergence and the increased brightness of the laser beam (cf. abstract, final sentence, in Rand). The laser output characteristics thus tuned therefore include brightness and divergence. Incorporation of the teaching by Rand implies the replacement of coating 20 (saturable absorber; cf. col. 4, l. 28) in Birnbaum by a coating comprising crystal 22 in Q-switch 12 of Rand (cf. col. 5, l. 32-39). Because the coating 6 is a separate part of the Q-switch combinability is ensured. Success in implementing the combination of the teaching by Rand with the invention by Birnbaum et al can therefore be reasonably expected.

On claim2: brightness is luminous power. Brightness in Rand is increased for the laser output, and hence for peak output power.

On claim 3: although neither Birnbaum et al nor Rand specifically teach the wafer (6 in Birnbaum et al, 22 in Rand) comprised in the passive Q-switch to have two optically polished surfaces, the lensing function of the variable transmittance means, as shown by its ability to cause beam convergence, is understood in the art of optics to be enhanced by polishing the two surfaces of 22 in Rand: the examiner takes official notice

that polishing lens surfaces enhances lensing function. The wavelength employed by both Birnbaum et al and Rand is in the infrared (IR) range (cf. col. 1, l. 56 in Birnbaum et al, and col. 5, l. 1 in Rand). Furthermore, said surfaces when optically coated or not do form a gradient variation of transmission at the laser wavelength, while intended purpose ("to form a gradient..") does not carry patentable weight in the present device application. Finally, how said surfaces are polished is irrelevant for the present device application, but instead only further limits the method of making said device.

On claim 4: as we have discussed under claim 3, said surfaces as rendered obvious are optically coated while they do form a gradient variation of transmission; claim 4 fails to further limit the invention over claim 3.

On claim 11: The semiconductor material (transition metal group II-VI semiconductor) taught by Birnbaum et al for their passive Q-switch is selected inter alia because of its saturable absorption in the IR spectrum (cf. title, abstract).

On claims 14-16: the laser system incorporating the semiconductor Q-switch as essentially taught by Birnbaum et al and Rand includes a solid-state laser (cf. col. 3, l. 25-40 in Birnbaum et al) that is lamp-pumped (cf. col. 2, l. 36-41) (claim 14) and is adapted to produce output at a wavelength centered at an IR (infrared) wavelength, namely of about 1.3 μm to about 1.9 μm (cf. claim 1, abstract and col. 2, l. 36-46 in Birnbaum et al) (claim 15), while Rand teaches the application to 1.06 μm (cf. col. 6, l. 1) (claim 16). It would have been obvious to include the latter wavelength as taught by Rand in the invention by Birnbaum et al because of the widespread use of this wavelength (CO_2 laser wavelength). No further alterations other than the adaptation of

the Q-switch material design as taught by Rand as discussed before are needed to combine the inventions.

5. ***Claim 9*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Birnbaum et al and Rand as applied to claim 1 above, and further in view of Early et al (6,394,788 B1). Although neither Birnbaum et al nor Rand necessarily teach the further limitation of claim 9, it would have been obvious to include said further limitation in view of Early et al, who teach in a patent on a laser with Q-switch (cf. title, abstract and col. 5, l. 60-65) that the coating of said Q-switch can be made to function as output coupler by applying an additional reflective coating (cf. col. 6, l. 30-33).

Motivation to include the teaching by Early et al in the invention as essentially taught by Birnbaum et al and Rand stems from the reduction of separate parts needed for the invention. Combination of said teaching with said invention is straightforward because only an additional coating has to be applied to one surface of the Q-switch. Success in implementing the combination can therefore be reasonably expected.

1. ***Claim 10*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Birnbaum et al and Rand as applied to claim 1 above, and further in view of Young (ISBN 0-387-16127-9) (previously made of record). Although Birnbaum et al nor Rand necessarily teach the laserable medium of the passive Q-switch to include undoped GaAs, it is standard knowledge in the field of semiconductor lasers that undoped GaAs ranks prominently among the possible embodiments of the laserable medium that are

most readily implemented, as witnessed by the text book by Young (see Table 7.1 on page 170 and discussion on pages 170-171; note the citation of 840 nm both in the table and text). The examiner furthermore takes official notice that GaAs is particularly desirable because of its properties with regard to radiation damage. Motivation stems at least from the relative simplicity of implementation and also from the known resilience against radiation damage (of GaAs). Combination of the inventions is straightforward, considering the experience with GaAs as a medium, while the material choice does not affect any other aspect of the invention by Birnbaum et al. Success in implementing the teaching by Young can thus be reasonably expected.

6. ***Claim 13*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Birnbaum et al and Rand as applied to claim 1 above, and further in view of Kitoh et al (5,621,747). Although neither Birnbaum et al nor Rand necessarily teach the further limitation as defined by claim 13, it would have been obvious to include said further limitation in view of Kitoh et al, who teach the inclusion of a multiple quantum well in a laser (cf. title and abstract) in order to suppress distortion and transmission deterioration at high yield (cf. col. 6, l. 36-40).

Motivation, to include the teaching by Kitoh et al, stems from the ubiquitous advantage of low distortion and high yield, and the disadvantage of transmission deterioration. Combination of the teaching by Kitoh et al and the invention as essentially taught by Birnbaum et al and Rand is straightforward: the laser light falls in the same infrared (IR) range, while the inclusion of multiple quantum wells in the actual active

region of the laser is quite independent of the design of the Q-switch. Success of the implementation of said combination can therefore be reasonably expected.

7. ***Claim 17*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Birnbaum (5,802,083) (henceforth called Birnbaum2) in view of Birnbaum et al (5,832,008). Birnbaum2 teaches a solid-state passive Q-switch (cf. Figure 1 for passive Q-switching experimental setup; cf. col. 2, l. 40 – col. 3, l. 25) comprising a body 5 (cf. col. 1, l. 55-56) of material having variable thickness at different locations of said body for tuning of output characteristics of laser pulses (see arrow for path length of said laser pulses). *Birnbaum2 does not necessarily teach* the further limitation that said solid-state passive Q-switch to be a semiconductor passive Q-switch. However, it would have been obvious to include said further limitation in view of Birnbaum et al who, in a patent on a passive Q-switch for wavelengths of about 1.5 to about 1.6 μm (hence analogous art to Birnbaum2's passive Q-switch for laser wavelengths of about 1.6 to about 2.3 mm; see abstracts in Birnbaum et al and Birnbaum2) that crystalline II-VI semiconductor materials are preferable for the passive Q-switch because of their high absorption cross section and long relaxation time (cf. col. 2, l. 47-64).

Motivation to include the teaching by Birnbaum et al in the invention by Birnbaum2 thus stems from the higher efficiency resulting from said high absorption cross section and long relaxation time. Combination of the teaching with the invention is straightforward through reselection of the material underlying the passive Q-switch. Success in implementing said combination can therefore be reasonably expected.

Allowable Subject Matter

2. ***Claims 6-8*** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the tuning in the semiconductor passive Q-switch taught by any of the cited prior art is not explicitly stated to be effected by translating the passive Q-switch in a direction perpendicular to the optical axis of the laser system or, - unlike the case of active Q-switches, moving the passive Q-switch itself in a curvilinear path such as rotating said passive Q-switch. Nor has this variable transmittance means been found in the prior art for the case of a semiconductor passive Q-switch. In prior art Fox et al (4,868,834), for instance, said prior art involving tuning of laser light in a configuration in which a Q-switch is instrumental the Q-switch has a trigger circuit, hence is not active, and the rotation is extraneous to the Q-switch.

3. ***Claim 12*** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

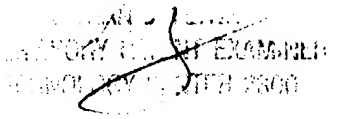
The following is a statement of reasons for the indication of allowable subject matter: neither InP nor AlGaAs has been in the prior art as material included in the semiconductor material of the specific semiconductor passive Q-switch as defined by the independent claim 1.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P Mondt whose telephone number is 703-306-0531. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 703-308-6601. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.



JPM
September 29, 2003